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A REVISION OF THE HYDROID GENUS *PERIGONIMUS* M. SARS, 1846

By WILLIAM J. REES

SYNOPSIS

During the past century nearly forty hydroids have been referred at one time or another to the genus *Perigonimus* M. Sars. The type species was demonstrated to be a *Bougainvillia* in 1938, and the status of all the other " *Perigonimus* " spp. is now considered and their position determined in accord with modern ideas on classification. They are distributed between the Orders Anthomedusae (Athecata), Leptomedusae (Thecata) and Limnomedusae, the majority being referred to four families of the first-mentioned Order.

Some material of *Perigonimus vestitus*, determined by Allman, has been re-discovered in the British Museum and is found to belong to *Leuckartiara octona* (Fleming). The original drawings of Joshua Alder's *Perigonimus linearis*, also in the Museum, reveal the presence of oral tentacles on the manubrium of the newly-liberated medusa, thus confirming that *Bougainvillia flavida* Hartlaub is identical with it.

INTRODUCTION

In 1938, I published a partial revision of *Perigonimus* in so far as it affected the groundwork for a monograph of British medusae, later published by F. S. Russell (1953). The earlier revision facilitated the establishment of common names for both the hydroid and the medusa of British species, but did not indicate the position of many extra-territorial ones whose status needed to be clarified. In this revision the position of these remaining species is considered and the conclusions reached earlier for others are re-stated briefly.

Michael Sars (1846) described a new handsome hydroid from the Norwegian coast under the name *Perigonimus muscoides* and also gave a brief, but inadequate, description of the medusa which is liberated with four tentacles. Later Allman (1864*a*), in his revision of Bougainvillid and other hydroids, referred a number of them which could not be placed in *Bougainvillia* (because they did not produce Bougainvillid medusae) to this genus of Sars on the assumption that they were cogeneric. Thus *Perigonimus* came to represent a group of *Bougainvillia*-like hydroids, which, either did not give rise to *Bougainvillia* medusae or had fixed gonophores. Gradually the picture emerged that the medusae of most of these non-*Bougainvillia* species belonged to another family, the Pandeidae. Hartlaub (1897 and 1914) demonstrated that *Perigonimus repens* was the hydroid of " *Tiara pileata* ", now known as *Leuckartiara octona* (Fleming), and that another Pandeid, *Halitholus cirratus* Hartlaub, also had a *Perigonimus* hydroid. More recently Rees & Russell (1937) were able to link the *Perigonimus serpens* kinds of hydroids with two species of medusae also of this family. Further revision of *Perigonimus* was made possible by the discovery that the type species of *Perigonimus* gave rise to a *Bougainvillia* medusa (Rees, 1938). Consequently *Perigonimus* became a synonym of *Bougainvillia* and no longer available as a name for hydroids which could not be placed in the same genus or even the same family.

As *Amphinema* (i.e., *Stomotoca*) had already been established by Rees & Russell (1937) for the hydroids as well as the medusae of this genus, *Leuckartiara* (already re-established for the medusa phase) was adopted for the appropriate hydroids, and *Rhizorhagium* M. Sars re-established for non-medusa bearing species.

As already mentioned this left a number of " *Perigonimus* " species either not satisfactorily classified or left out of consideration, and, in the brief notes below, it has been thought desirable to indicate their present status and where possible to add new information.

THE SPECIES WHICH HAVE BEEN REFERRED TO *PERIGONIMUS*.

Perigonimus abyssi G. O. Sars

Perigonimus abyssi G.O. Sars, 1873, *Forh. Vidensk. Selsk. Krist.*, **1873** : 126, Tab. v, figs. 27–30.

The newly liberated medusa of this minute species becomes free with two opposite tentacles and two partly developed tentacles on the other perradial bulbs (Rees, 1938). It is a Pandeid and has been referred provisionally to *Leuckartiara* Hartlaub pending further knowledge of its possible relationship with medusae of the genera *Leuckartiara, Neoturris* or *Catablema.*

Perigonimus antarcticus Hickson & Gravely

Perigonimus antarcticus Hickson & Gravely, 1907, *Nat. Antarct. Exped.*, 1901–1904, *Nat. Hist.*, **3** : 1, pl. i, figs. 1–3 ; pl. iv, fig. 32.

This species was placed in *Atractylis* (synonymous with *Bougainvillia*) by Vanhoffen (1910) and in a new genus *Gravelya* by Totton (1930), but its affinities lie with *Rhizorhagium* M. Sars, to which genus it was referred by Stechow (1919) and by Rees (1938). This last mentioned genus seems to be well constituted for simple Bougainvillid hydroids with fixed gonophores, but its relationship to *Aselomaris* Berrill and *Garveia* Wright will have to be considered in a wider revision of the Bougainvillidae.

Perigonimus apicatus Brooks

Perigonimus (*Stomotoca*) ***apicata*** Brooks, 1884, *Zool. Anz.*, **7** : 711.

This is the name given by Brooks to the hydroid of *Stomotoca apicata*, now known as *Stomotoca dinema* (Péron & Lesueur). Mayer (1910, p. 113) referred this hydroid to *S. rugosa* Mayer, but the absence of an apical projection in the newly liberated medusa points to *S. dinema*, as does the name used by Brooks for his hydroid.

Perigonimus bitentaculatus (Wright)

Atractylis bitentaculata Wright, 1867, *Proc. R. Phys. Soc. Edinb.*, **3** : 45, pl. i, fig. 5.

This species was referred provisionally to *Perigonimus* by Hincks (1868), but Wright himself gives the best clue as to the relationships of his species in the following sentence: "They have the habit, like that of *Lar* (Gosse), of quickly and repeatedly bending down the body until the mouth is brought close to the surface on which the zoophyte grows."

This species has not been reported since it was found by Wright in a *Pecten* shell dredged from the Firth of Forth near Inch Keith. The characters of the hydranth with its two opposite tentacles strongly suggest that the hydroid is related to *Proboscidactyla* (*Lar* of Gosse) and should be placed in the same family. The possibility should not be overlooked that this species may prove to belong to *Pochella polynema* Hartlaub, the only other medusa of this family known to occur in British waters. I do not propose to create a new genus for this species, but merely note that its position appears to be in the family Proboscidactylidae of the Order Limnomedusae.

Perigonimus cidaritis Weismann

Perigonimus cidaritis Weismann, 1883, *Entstehung der Sexualzellen bei den Hydromedusen*, Jena, p. 117, pl. xii, fig. 10–11.

This hydroid has a well-marked pseudohydrotheca in which the bases of the tentacles are protected in tube-like extensions of the perisarc as in *Bimeria* and *Thamnostoma*. As the medusa is a Bougainvillid closely related to *Thamnostoma russelli* Rees and there is very little difference in the hydroids, *P. cidaritis* has been referred to *Thamnostoma* by Rees (1938).

Perigonimus cirratus Hartlaub

Perigonimus cirratus Hartlaub, 1914, *Nord. Plankt.*, Lief. 17, XII: 274, fig. 234.

Hartlaub (1914) gave the name *P. cirratus* to the hydroid of the medusa *Halitholus cirratus* which he described in the same memoir, presumably for the reason that it was then customary to adhere to a dual system of classification. There are now no legitimate reasons why the hydroid should not also take the name *Halitholus*.

Perigonimus coccineus (Wright)

Atractylis coccinea Wright, 1861, *Ann. Mag. Nat. Hist.*, (3) **8**: 130.

E. S. Russell (1907) is the only author who has reported this species since it was originally described by Wright. In 1938 I suggested that the species might prove to be identical with *Rhizorhagium roseum.*

Perigonimus confertus (Alder)

Eudendrium ? confertum Alder, 1856, *Trans. Tyneside Nat. Fld. Cl.*, **3**: 103, pl. iii, figs. 5–8.

Allman (1859) placed this species in *Dicoryne* because of the peculiarities of the gonophores, an assessment which has been generally approved. Recently Vervoort (1946) used the name *Perigonimus confertus* for the first time for this species, although presumably aware that this name is synonymous with *Bougainvillia* and therefore no longer available. The name *Dicoryne conferta* has been the established name of this species since 1859 and I see no reason to change it.

Perigonimus decorans Schneider

Perigonimus decorans Schneider, 1897, *Zool. Jb.* Syst., **10** : 479.

Schneider's description is too inadequate even to indicate in what family thi hydroid could be placed.

Perigonimus formosus Fewkes

Perigonimus formosus Fewkes, 1889, *Bull. Essex Inst.*, **21** : 102, no figure.

Some small thumb-nail sketches of this species have been given by Fraser (1937 p. 35, pl. v, fig. 20) ; they indicate that *P. formosus* should be placed in *Rhizorhagiu* M. Sars. A new description, especially of the gonophores, is much needed to determin the relationship of the species to *R. roseum*.

Perigonimus gelatinosus Duerden

Perigonimus gelatinosus Duerden, 1895, *Sci. Proc. R. Dublin Soc.*, N.S., **8** : 325, 327, pl. xi figs. 2-3.

Duerden's species is not identifiable with certainty with any known British specie although there is a possibility that it is identical with *Leuckartiara octona* as suppose by Hartlaub (1914). The complete retraction of the hydranth within the pseudo hydrotheca could be due to poor preservation and by itself is no indication of specifi differences.

Perigonimus georginae Hadzi

Perigonimus georginae Hadzi, 1913, *Rad. Jug. Akad. Znan. Umj.*, **200** : 98, figs. 7, 10 and 11.

The original description by Hadzi is not very satisfactory. He appears to hav confused at least two species. His figure 7 is a *Stomatoca* hydroid, his figure 8 represents a *Bougainvillia*, and the newly liberated medusa, although combining some o the features of two species of *Stomotoca* medusae, cannot be referred with certaint to either *S. rugosa* Mayer or to *S. dinema* (Péron & Lesueur). Until the Adriati medusae have been re-investigated it seems preferable to let this species retain it identity as *Stomotoca georginae*. The name *Dinema* applied by Hadzi to the medus is a synonym of *Leuckartiara*, a member of a different sub-family.

Perigonimus (?) inflatus Duerden

Perigonimus (?) *inflatus* Duerden, 1895, *Sci. Proc. R. Dublin Soc.*, N.S., **8** : 329, pl. xiv, fig.

This little known species does not seem to have been reported since Duerden' original description. It is here referred provisionally to *Rhizorhagium* M. Sars.

Perigonimus jonesii Osborn & Hargitt

Perigonimus jonesii Osborn & Hargitt, 1894, *Amer. Nat.*, **28** : 27, figs. 1–12.

I have followed Hartlaub (1914) in placing this species in the synonymy o *Leuckartiara octona* (Fleming). The colony described by Osborn & Hargitt compare favourably with those found on *Scaphander lignarius* in British waters.

Perigonimus linearis (Alder)

Atractylis linearis Alder, 1862, *Trans. Tyneside Nat. Fld. Cl.*, **5** : 230, pl. x, figs. 1–3.

Alder's *Atractylis linearis* was tentatively referred to *Perigonimus* by Allman (1864*a*). The newly liberated medusa has a very thick jelly and a small subumbrellar cavity, and in this it resembles *Bougainvillia flavida* Hartlaub (1897), an opinion later expressed by Hartlaub himself (1911). The published drawings of Alder do not suggest any oral tentacles on the manubrium of the medusa, but fortunately his original drawings (from which the engraving for his paper (1862, pl. x, figs. 2 and 3) was prepared) are preserved in the British Museum (Nat. Hist.), having been acquired by Canon A. M. Norman and later bequeathed by him. These drawings do show the oral tentacles faintly and so the two species can be regarded as identical.

Russell (1953) does not venture an opinion on the status of *P. linearis* or its medusa, but suggests that *B. flavida* may prove to be the hydroid of *Bougainvillia britannica*. Until this relationship can be demonstrated I propose to retain Alder's species under the name *Bougainvillia linearis* (Alder, 1862).

Perigonimus maclovianus (Lesson)

Perigonimus maclovianus Vanhoffen, 1910, *Dtsch. Sudpolar-Exped.*, **11** : 272, fig. 10*a–d* (hydroid).

The medusa of this species was described under the name *Cyanaea bougainvillii* by Lesson (1830), who later made it the type species of *Bougainvillia* under the name *B. macloviana* (1836). This is the name in common use to-day for both hydroid and medusa, although Vanhoffen (1910), who first described the hydroid, referred it to *Perigonimus*. Both Stechow (1919, p. 21) and Kramp (1928, p. 50) pointed out that *Bougainvillia* was the correct generic name for both hydroid and medusa.

Perigonimus minutus Allman

Perigonimus minutus Allman, 1863, *Ann. Mag. Nat. Hist.*, (3), **11** : 11.

Allman's *Perigonimus minutus* has been referred to *Leuckartiara octona* both by Hartlaub (1914) and Rees (1938). Allman's description and figures (1871–2, pl. xi, figs. 4–6) correspond closely with the slender polyps such as are commonly found on *Scaphander lignarius* (Rees, 1938, p. 14 fig. 3*d–f*).

Perigonimus miniatus (Wright)

Atractylis miniata Wright, 1863, *Proc. R. Phys. Soc. Edinb.*, **2** : 351.

Wright's *Atractylis miniata* was referred provisionally to *Perigonimus* by Hincks (1868). The reproduction of the species is not known, but the description suggests that Wright was describing a colony of *Rhizorhagium* and *R. roseum* in particular.

Perigonimus multicornis Allman

Perigonimus multicornis Allman, 1874, *Nature, Lond.*, **11** : 179.

A re-examination of Allman's type material in the Zoological Museum, Copenhagen by Kramp (1926) revealed that the species was *Eudendrium ramosum*.

Perigonimus muscoides M. Sars

Perigonimus muscoides M. Sars, 1846, *Fauna Littoralis Norvegiae*, Heft. **1** : 8, Tab. 1, figs. 19–21.

This is the type species of *Perigonimus* and the elucidation of its life history by Rees (1938, p. 2) revealed that its medusa was a *Bougainvillia, B. nordgaardi* (Browne, 1903). *Perigonimus* M. Sars, 1846, thus falls into the synonymy of *Bougainvillia* Lesson 1836 and the name *Bougainvillia muscoides* becomes applicable to both hydroid and medusa as demonstrated in the above paper.

Perigonimus muscus Allman

Perigonimus muscus Allman, 1863 ; *Ann. Mag. Nat. Hist.* (3), **11** : 12.

This species was referred to *Bougainvillia* by Allman (1864*a*). It was considered to be synonymous with *Bougainvillia ramosa* by Hartlaub (1911) and this view was confirmed by the studies of Brink (1925) who demonstrated that colonies passed through a *muscus* stage when young before reaching the stage typified by the usual *ramosa* kind of colony.

Perigonimus (?) nanellus Stechow

Perigonimus (?) *nanellus* Stechow, 1919, *Zool. Jb. Syst.*, **42** : 14, fig. C.

I consider this species to be a *Bougainvillia*, possibly representing a well formed colony of one of the common species, and pending further knowledge of its life history it is now referred to this genus as *B. nanellus*.

Perigonimus napolitanus Hargitt

Perigonimus napolitanus Hargitt, 1904, *Mitt. zool. Sta. Neapel*, **16** : 571, taf. 22, fig. 25.

This species is not recognizable.

Perigonimus nudus Stechow

Perigonimus nudus Stechow, 1919, *Zool. Jb. Syst.*, **42** : 16, fig. D.

The form of the hydranth as noted by Stechow resembles those of the medusa-bearing Campanopsinae of the family Haleciidae and the relationships of the species undoubtedly lie with this group rather than with any Athecate (Anthomedusan) group.

Perigonimus ? nutans Hincks

Perigonimus (?) *nutans* Hincks, 1877, *Ann. Mag. Nat. Hist.*, (4), **19** : 149, pl. xii, fig. 1.

Rees & Russell (1937, p. 71) regard this species as possibly a young polyp of the *Perigonimus serpens* type ; this kind of hydroid belongs to the genus *Amphinema*. There are two species in British waters, *A. dinema* and *A. rugosum*, and these are so alike that it is not possible to assign this species to one or the other.

Perigonimus palliatus (Wright)

Atractylis palliata, Wright, 1861, *Ann. Mag. Nat. Hist.* (3), **8** : 129, pl. iv, figs. 6 and 7.

In this species the pseudohydrotheca is large and dilated, but I do not think it has any special significance as a diagnostic character. The medusa, according to Wright

(1861) " resemble exactly those of *Atractylis* (*Perigonimus*) *repens* ", that is, *Leuckartiara octona* (Fleming). Wright's colony was on a shell inhabited by a hermit crab *Eupagurus bernhardus* and the size of the pseudohydrotheca can be attributed to habitat and feeding conditions as in the other colonies of *Leuckartiara octona* living under similar conditions (see Rees, 1938, p. 16, fig. 5). I regard the two species as identical.

Perigonimus pugetensis Heath

Perigonimus pugetensis Heath, 1910, *Biol. Bull. Woods Hole*, **19** : 74, figs. 1 and 2.

This small hydroid was found growing on a fish, *Hypsagonus quadricornis* (C. & V.) ; it was found that its newly liberated medusa was a Pandeid like *Leuckartiara octona*.

Hartlaub (1914) doubted whether the species was distinct from *L. octona*, and the latter has since proved to be a cosmopolitan species. Rees (1938) found a colony of *L. octona* growing on a fish, *Agonus cataphractus*, and this colony compared very favourably with that of Heath. It is now proposed to regard *P. pugetensis* as a synonym of *L. octona*.

Perigonimus pusillus (Wright)

Eudendrium pusillum Wright, 1857, *Edinb. New Phil. J.*, N.S., **6** : 84, pl. ii, fig. 8, 9.

Stechow (1919) revived the name *pusillus* for the better known name *Perigonimus repens* (Wright, 1858). It appears that Wright changed the name of his species to *repens* on the receipt of a paper by M. Sars (1857) in which he described a species of *Halecium* under the name *Eudendrium pusillum*.

Wright's species falls into the synonymy of *Leuckartiara octona* (Fleming).

Perigonimus quadritentaculatus (Wright)

Atractylis quadritentaculata Wright, 1867, *Proc. R. Phys. Soc. Edinb.* **3** : 45, pl. i, fig. 6.

This creeping form with long stolons and sessile, four tentacled hydranth is possibly a juvenile Bougainvillid, which cannot be identified with certainty with any particular species.

? *Perigonimus robustus* Fraser

? *Perigonimus robustus* Fraser, 1938, *Rep. Hancock Pacific Exped.*, **4**, No. 1 ; 17, pl. iii, fig. 12.

In the absence of information on the gonophore this species cannot be satisfactorily classified, and is therefore provisionally placed in *Bougainvillia*.

Perigonimus roseus (M. Sars)

Rhizorhagium roseum M. Sars, 1877, *Fauna Littoralis Norvegiae*, Heft **3** : 28, Tab. ii, figs. 37–43.

The genus *Rhizorhagium* was created for this species by Sars, and although the type species was referred for a time to *Perigonimus* by Bonnevie (1899) and others, the genus was re-instated by Rees (1938).

Perigonimus sarsii Bonnevie

Perigonimus sarsii Bonnevie, 1901, *Bergens Mus. Meeresfauna von Bergen*, Heft I, p. 6.

This species has been referred to *Rhizorhagium* by Rees (1938) and there is a distinct possibility that the species is founded on a colony of *R. roseum*, growing over the stems of another hydroid.

Perigonimus schneideri Motz-Kossowska

Perigonimus schneideri Motz-Kossowska, 1905, *Arch, Zool. exp. gén.*, (4), **3** : 72, fig. VI.

Stechow (1922) created a new genus *Perarella* for this species and indicated that its position was not in the Hydractinidae but rather in the Bougainvillinae near *Atractylis*.

Since then Komai (1931) has described the hydroid of the medusa *Cytaeis japonica*, to which the present species is clearly related. Both species have the following features in common : a reticulate anastomozing network of stolons, a short collar round the base of the hydranth, the hydranth itself long and tubular, of the *Podocoryne* type, and the gonophores borne singly on the hydrorhiza.

I propose to retain *Perarella* for Cytaeid hydroids in which there are fixed gonophores and to place the genus in the family Cytaeidae, L. Agassiz, 1862. Agassiz's definition excludes unrelated forms such as *Podocoryne* (including *Lymnorea*), *Turritopsis* and *Oceania*, which Uchida (1927) and others have placed in the family.

While possessing distinct oral *tentacles* on the manubrium of the medusa as in the Bougainvillidae, the presence of simple perradial tentacles together with the characters of the hydroid justify the existence of a separate family for *Cytaeis* and *Perarella*—a family in which the combined characters of hydroid and medusa present some characters in common with both the Hydractinidae and the Bougainvillidae, but none of their specialized features.

Perigonimus serpens Allman

Perigonimus serpens Allman, 1863, *Ann. Mag. Nat. Hist.* (3), **11** : 10.

Rees and Russell (1937) have referred this species to *Amphinema dinema* following the elucidation of the life history of this medusa and its hydroid. Allman (1871–2) clearly indicated in his illustrations of the medusa that he was dealing with this species and not with the closely related *A. rugosum*.

Perigonimus sessilis (Wright)

Eudendrium sessile Wright, 1857, *Edinb. New Phil. J*, N.S., **6** : 90, pl. iii, figs. 16–17.

This is the sessile form of *Leuckartiara octona* (Fleming). When the colony is growing on an uneven, constantly abraded surface the hydranths remain sessile in protected hollows or grooves and do not progress beyond the *sessilis* stage (Rees, 1938).

Perigonimus steinachi Jickeli

Perigonimus steinachi Jickeli, 1883, *Gegenbaurs Jb.*, **8** : 617, pl 27, figs. 1–9.

Jickeli gives a totally inadequate description of the morphology of his hydroid (although he discusses its histology at length) and it is not possible to indicate what it might be.

Perigonimus sulfureus Chun

Perigonimus sulfureus Chun, 1889, *S. B. Akad. Wiss. Berlin*, **1889** (2) : 524.

Stechow (1921 and 1923) created a new genus *Perigonella* for this species and placed it with the Hydractinians near *Stylactella*. Steche (1906) figures a well-developed medusa bud with conical bulbs with tentacles and manubrium devoid of oral tentacles, but we have insufficient information to assign this species to a family.

Perigonimus vagans Thornely

Perigonimus vagans Thornley, 1908, *J. Linn. Soc. Zool.*, **31** : 81, pl. ix, fig. 1.

This species is now referred provisionally to *Bougainvillia* pending the re-discovery of the hydroid. Thornely's description is insufficient to permit any other suggestions.

Perigonimus vestitus Allman

Perigonimus vestitus Allman, 1864*b*, *Ann. Mag. Nat. Hist.*, Ser. (3), **14** : 57.

In 1846 Allman described a new *Perigonimus*, *P. vestitus* from the Firth of Forth, in which, to quote his 1872 diagnosis the " posterior part of the body [of the hydranth], invested by the rough perisarc, which is thence continued as a delicate, smooth membrane over the remainder of the body nearly as far as the mouth ". His figures (1871, pl. xi, figs. 1–3) show the pseudohydrotheca (that is the perisarcal investment of the hydranth) to extend anteriorly beyond the tentacles close to the mouth. There is no suggestion that this perisarc is perforated to allow the tentacles to project (as they do) and no suggestion of any tubular perisarcal sheathing encircling the base of any tentacle. This seems to be one of the few occasions on which this far-sighted pioneer of hydroid systematics failed to make a satisfactory description.

Stechow (1919) referred *P. vestitus* to the medusa genus *Cytaeis* presumably on an assumed relationship between the hydroid and medusa of *vestitus* with *Perigonimus cidaritis*. There were no real grounds for this, as the figures demonstrate that *P. vestitus* gives rise to a typical Pandeid medusa, so that it must be stated that the species is related to genera like *Leuckartiara*, *Amphinema* and *Halitholus*.

In *Perigonimus vestitus* too, the bases of the tentacles are not enclosed in perisarcal tubes extending from the pseudohydrotheca itself. Such a feature is characteristic of *Bimeria*, *Thamnitis* and *Thamnostoma*, and the medusa of the latter clearly has affinities with the Bougainvillidae rather than the Pandeidae. *Cytaeis*, which Stechow erroneously associated with these Bimerid hydroids, belongs to none of these families.

Hartlaub (1914) in his revision of the Tiaridae had listed *Perigonimus vestitus* under the synonymy of *Leuckartiara octona*, but I was reluctant to follow him in my study of variation in the hydroid of this species (1938) in view of the diagnosis given by Allman. Fortunately, material of *Perigonimus vestitus* determined by Allman, growing on *Lepidochiton cinereus*, has recently been found in the collections of the British Museum (B.M. No. 1877.4.12.31).

A re-examination reveals that although the soft parts have disappeared the chitonous perisarc of the stems and pseudohydrothecae are still present. The latter are very similar in appearance to those that I described for a colony of *Leuckartiara octona* (Fleming) on *Corystes cassivelaunus* (Rees, 1938, p. 16, fig. 5). There is no suggestion of any perisarcal sheaths such as are found in *Bimeria*. The colonies exhibit no features that could not be found in a well-developed colony of *Leuckartiara octona*, and the characters of the medusa, as described by Allman, support this. For these reasons the species *vestitus* is placed in the synonymy of *Leuckartiara octona* (Fleming).

Perigonimus yoldiae-arcticae Birula

Perigonimus yoldiae-arcticae Birula, 1897, *Annu. Mus. Zool. Acad. St. Petersb.* **2** : 86, pl. x, fig. 3.

Jäderholm (1909) gives an excellent figure of this hydroid. I have examined material from the following localities :

Zoologiske Museum, Copenhagen.

Kandalakscha, on *Yoldia arctica*, 24 fm. (from St. Petersbourg Museum).

Riksmuseum, Stockholm.

Kandalakscha, 21–27 fm. Coll. N. Knipowitsch (from St. Petersbourg Museum).
Kandalakscha, 20–25 fm. Coll. A. Birula (from St. Petersbourg Museum).
Nordenskiold's Sea, 77° 1^1 N., 114° 35^1 E., 3.ix.1901 (Russian Polar Expedition, 1900–1903, St. 46).
Nordenskiold's Sea, 75° 42^1 N., 124° 41^1 E., 6.ix.1901 (Russian Polar Expedition, 1900–1903).
East Greenland, Franz-Josef Fjord (Muskoxfjord), 21.viii.1900, 220 m. (Swedish zoological Polar Expedition, 1900, St. 27).

All the material from the above localities is sterile. The pseudohydrotheca of the hydranth reaches almost to the tentacles, and in one hydranth it is a little loose-fitting and wrinkled which permits its limits to be seen. There is no indication of a web between the tentacles.

The most interesting (and also the characteristic) feature of this hydroid is the formation of ' nodes ' on the stems, and if we accept the belief that the species is a gymnoblastic hydroid (as seems most likely), these " nodes " indicate points of regeneration after periodic dying down of the hydranths. The species is referred provisionally to *Bougainvillia.*

SYNOPSIS OF THE STATUS OF THE DIFFERENT SPECIES OF " PERIGONIMUS "

Order ATHECATA (ANTHOMEDUSAE)

	(Original name)
Family CYTAEIDAE	
Genus *Perarella* Stechow	
Perarella schneideri	*Perigonimus schneideri* Motz-Kossowska
Family BOUGAINVILLIDAE	
Sub-family THAMNOSTOMINAE	
Genus *Thamnostoma* Haeckel	
Thamnostoma cidaritis	*Perigonimus cidaritis* Weismann
Sub-family BOUGAINVILLINAE	
Genus *Bougainvillia* Lesson	
Bougainvillia macloviana	*Perigonimus macloviana* Vanhoffen
Bougainvillia muscoides	*Perigonimus muscoides* M. Sars
Bougainvillia ramosa	*Perigonimus muscus* Allman
Bougainvillia linearis	*Atractylis linearis* Alder

Provisionally also:	
Bougainvillia nanellus	*Perigonimus* (?) *nanellus* Stechow
Bougainvillia robusta	*Perigonimus robustus* Fraser
Bougainvillia vagans	*Perigonimus vagans* Thornely
Bougainvillia yoldiae-arcticae	*Perigonimus yoldiae-arcticae* Birula
Bougainvillia sp.	*Atractylis quadritentaculata* Wright
Genus *Dicoryne* Allman	
Dicoryne conferta	*Eudendrium confertum* Alder
Genus *Rhizorhagium* M. Sars	
Rhizorhagium roseum	*Rhizorhagium roseum* M. Sars
	Perigonimus sarsii Bonnevie
	? *Atractylis coccinea* Wright
	? *Atractylis miniata* Wright
	? *Perigonimus inflatus* Duerden
Rhizorhagium antarcticum	*Perigonimus antarcticus* Hickson & Gravely
Rhizorhagium formosum	*Perigonimus formosus* Fewkes
Family Pandeidae	
Sub-family Stomotocinae	
Genus *Stomotoca* L. Agassiz	
Stomotoca dinema	*Perigonimus serpens* Allman
	Perigonimus (?) *nutans* Hincks
	Perigonimus apicatus Brooks
Stomotoca georginae	*Perigonimus georginae* Hadzi
Sub-family Pandeinae	
Genus *Leuckartiara* Hartlaub	
Leuckartiara octona	*Eudendrium pusillum* Wright
	Eudendrium sessile Wright
	Eudendrium repens
	Atractylis palliata Wright
	Perigonimus minutus Allman
	Perigonimus vestitus Allman
	Perigonimus jonesii Osborn & Hargitt
	Perigonimus pugetensis Heath
	? *Perigonimus gelatinosus* Duerden
Provisionally also :	
Leuckartiara abyssi	*Perigonimus abyssi* G. O. Sars
Genus *Halitholus* Hartlaub	
Halitholus cirratus	*Perigonimus cirratus* Hartlaub
Family Eudendriidae	
Genus *Eudendrium* Ehrenberg	
Eudendrium ramosum	*Perigonimus multicornis* Allman

Order THECATA (LEPTOMEDUSAE)

Family Haleciidae	
Sub-family Campanopsinae	
	Perigonimus nudus Stechow

Order LIMNOMEDUSAE

Family Proboscidactylidae	
Genus *Pochella* Hartlaub	
? *Pochella polynema*	*Atractylis bitentaculata* Wright

INCERTAE SEDIS

Perigonimus decorans Schneider
Perigonimus napolitanus Hargitt
Perigonimus steinachi Jickeli
Perigonella sulphureus (*Perigonimus sulphureus* Chun)

These few species which I have been unable to classify are insufficiently described.

The above classification is in accord with recent progress, but some of it may not be familiar to specialists who work only on hydroids and leave the medusa phase out of consideration. I believe with Allman (1864*a*) that "An adequate conception of the hydroid can thus only be obtained by regarding it as the product of two factors, one of them finding its expression in the trophosome, and the other in the gonosome". The result is frequently a mosaic, a blending of characteristics into a pattern which gives a much better picture of the position of the living species than does consideration of only a part of the life history.[1]

Much has been written by Kramp (1941 and 1949) about the dangers of attempting a single classification for hydroids and medusae, but its outlines are already apparent for the Anthomedusae, and this revision of *Perigonimus* is intended as a contribution towards it.

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ON THREE NORTHERN SPECIES OF *HYDRACTINIA*

By WILLIAM J. REES

(*With Plates 11–12*)

SYNOPSIS

Three species of *Hydractinia, H. allmani* Bonnevie, *H. carica* Bergh and *H. monocarpa* Allman from the Arctic are redescribed from numerous colonies. The great differences noted between colonies of the same species are shown to depend on the stage of reproductive exhaustion reached when the colonies were taken. What is known of their biology and distribution is summarized.

INTRODUCTION

Hydractinia is a large genus, and, of the many species which have been described, few have been worked on alive prior to a description being drawn up. In consequence many of the specialists who have worked on these animals (perforce from Expedition material) have seldom considered the specimens before them as having been something alive and constantly changing. Inevitably phases in growth and reproduction as well as ecological forms have on occasion been described as distinct species.

The northern *Hydractinia* species have been partially revised by Broch (1916) and Kramp (1932) so that there is now less confusion about the identity of arctic and subarctic forms. Some species however require redescription based on re-examination of as many colonies as possible in order to eliminate the use of so-called diagnostic features which are due to growth, seasonal variation, reproductive activities or reflect environmental conditions.

In species like *Coryne* where the gonophores are borne directly on the body of the hydranth, these reproductive activities cause the hydranth itself to be resorbed and often reduced to a mere stump without tentacles. This phenomenon may be termed reproductive exhaustion and it is by no means confined to the capitate hydroids where its effects are most noticeable. In *Hydractinia* reproductive exhaustion manifests itself first in the fertile polyps (or special reproductive polyps as the case may be) and also causes some reduction in the size of the nutritive polyps. I first noticed an appreciable reduction in the size of the sterile polyps in a Hydractinid due to this cause in the undescribed hydroid of *Podocoryne borealis*. During the fifteen days I had it under observation, it was producing large numbers of medusae, and by the time I was certain that it was distinct from the better-known *P. carnea*, the colony had altered so much in appearance that I could not honestly describe it in that condition (Rees, 1941).

This paper is confined to observations on three northern species, *Hydractinia allmani* Bonnevie, *Hydractinia carica* Bergh and *Hydractinia monocarpa* Allman, and is based on the rich arctic and subarctic collections of the Naturhistoriska Riksmuseum, Stockholm. Some of the material has been briefly described by Elof Jäderholm, but all the locality records of colonies in the Riksmuseum have been reported by him in various papers.

Hydractinia allmani Bonnevie

Hydractinia allmanii Bonnevie, 1898, *Z. wiss. Zool.*, **63** : 485, pl. xxvi, figs. 36–37.
Bonnevie, 1899, *Norske Nordhavs Exped.*, 1876–8, **26** : 47, pl. i, fig. 1.
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Broch, 1903, *Bergens Mus. Årb.* **1903**, No. 9, Table.
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Jäderholm, 1909, *K. Svenska Vetensk-Akad. Handl.* **45**, No. 1 : 49.
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Kühn, 1910, *Zool. Jb.* (*Anat.*), **30** : 107.
Kramp, 1914, *Medd. Grønland*, **23** : 988.
Broch, 1916, *Danish Ingolf Exped.* **5** : 44.
Rylov, 1923, *Annu. Mus. Zool. Acad. St. Petersb.*, **24** : 151.
Kramp, 1943, *Medd. Grønland*, **121**, No. 11 : 8.

Type locality. Norske Nordhavs Expedition 1876–78, St. 137, 67° 24′ N., 8° 58′ E., 827 m. (Zoological Museum, Oslo) Type locality selected here.

Material seen. In Riksmuseum, Stockholm :
Swedish Polar Expedition, 1900.
St. 17, Mackenzie Bay, north of Franz Josef Fjord, E. Greenland, 12–35 m.
St. 23, Mackenzie Bay, north of Franz Josef Fjord, E. Greenland, 3–10 m.
St. 27, Muskoxfjord, Franz Josef Fjord, E. Greenland, 220 m.
Russian Polar Expedition, 1900–1903.
St. 10 *d*, Kara Sea, 73° 27′ N., 79° 15′ E., 40 m.
St. 18, Gulf of Middendorff, 75° 54′ N., 92° 59′ E., 12–14 m.
St. 50, north of New Siberian Isles, 77° 20′ 30″ N., 138° 47′ E., 38 m.
Otto Torell : Bellsund, Spitzbergen, 8–12 fm.

Specific Characters. *Hydractinia* with encrusting base, with few simple, smooth spines. No tentaculozooids or spiral zooids. Nutritive polyps, long columnar (1·4–15·0 mm. high) with up to 16 filiform tentacles. Reproductive polyps (0·75–5·0 mm.) at first with hypostome and at least 8 tentacles becoming reduced to stumps with armed proboscis and even without tentacles. Usually one large and one small gonophore on each reproductive polyp.

Gonophores (0·6—1·4 × 0·5—1·3 mm.). Female, cryptomedusoid with 4 well-developed radial canals and 8 teat-like tentacle rudiments. Eggs numerous, polygonal at first becoming rounded or oval and escaping through a pore between the tentacle rudiments. Male gonophores also cryptomedusoid.

DISTRIBUTION. Apart from two records in rather deep water off the Norwegian coast, viz: position, 67° 24′ N., 8° 58′ W., S.W. of the Lofotens at a depth of 827 m. (Bonnevie, 1899) and position 63° 12′ N., 1° 30′ E., at a depth of 1320 m. (Broch, 1903), *H. allmani* has been found mainly in the high Arctic.

It has been found in the Spitzbergen area on a number of occasions (Bonnevie, 1899; Jäderholm, 1909 and Rylov, 1923). To the east the Russian Polar Expedition 1900–1903 took it in the Kara Sea, the Gulf of Middendorff and north of the New Siberian Islands (Jäderholm, 1908). In Greenland it was taken at three stations by the Swedish Polar Expedition, 1900, in the neighbourhood of Franz Josef Fjord (Jäderholm, 1902) and in Kempes Fjord by the Swedish Grönland Expedition, 1899. Other Greenland records from Hurry Fjord (Scoresby Sound area), Kempes Fjord, Vega Sound and the mouth of Forsblad Fjord are given by Kramp (1943).

The absence of records from the Okhotsk Sea and the Bering Sea are possibly due to lack of observations and the species may prove to be circumpolar in distribution.

DESCRIPTION. This is a large and handsome *Hydractinia*, but small and intermediate colonies occur and the species is very variable. For this reason several colonies are described below.

Fully grown colonies before the onset of reproductive exhaustion, as already mentioned above, are large and handsome and the following description is based on a colony from Muskoxfjord, East Greenland (Pl. 11, figs. 3–4). The encrusting base, which is continuous, has few spines, and arising from it are long spindly nutritive polyps reaching a height (to hypostome) of 8·0–13·5 mm. in preserved material. There is a well developed, conical proboscis, which is armed with a few nematocysts, with at its base, a circle of about 15 tentacles in a close double whorl. Each hydranth arises directly from the hydrorhiza and there is no distinct ring of perisarc at this point although the perisarc forms a thin wrinkled sheath.

The largest reproductive hydranths are 1·6–4·5 mm. high, that is, they are only about half the length of the nutritive ones, and from this colony it is not possible to say whether they are derived from nutritive polyps. The largest seen had a length of 4·5 mm.; it had a conical proboscis moderately well armed with nematocysts at its distal end. The tentacles were four in number and only 0·2 mm. in length. Some distance below the head of the hydranth it carried one large and one small gonophore. Other blastostyles ranged down to 1·6 mm. in height and the tentacles were sometimes reduced to mere knobs. Each blastostyle usually carried one large and one rudimentary gonophore. None of the gonophores was fully developed, the largest having a diameter of 1·4 mm. No spiral zooids have been observed.

Both male and female gonophores occur in the same colony. They are cryptomedusoids with well developed radial canals and the tentacle bulb rudiments are represented by four slightly pigmented areas (more mature gonophores are described from the colony taken at Mackenzie Bay, East Greenland on 1st August, 1900).

Another colony from Mackenzie Bay (also East Greenland) has similar gonophores, but the nutritive polyps are either less well developed or retracted (due to preservation methods) (Pl. 11, figs. 1 and 2). The polyps have a height of up to 5 mm. Likewise the gonophores are not fully mature and the blastostyles themselves are quite small being only 1·3–1·5 mm. in total height.

A second colony from Mackenzie Bay taken on 1st August, 1900, has distinctly smaller hydranths, these being less than 3·0 mm. in height, but both male and female gonophores are fully developed. The female gonophore is fully developed at 1·2 mm. in diameter and the tentacular rudiments are represented by 4 - 8 teat-like processes and the manubrium may protrude through the opening by which the eggs escape.

Another colony taken by the Russian Polar Expedition, 1900–1903, St. 50, north of the New Siberian Islands, is remarkable for the length of the nutritive polyps which are up to 14·3 mm. in height. The female gonophores are ripe (Pl. 11, fig. 7) and the male ones nearly so. The blastostyles vary from 1·5 mm. to 3·3 mm. in height and the larger carry 8 tentacles and the smaller ones only 1 or 2. Typically only 2 gonophores, one large and one small, are found on each blastostyle. The ripe female gonophore has 4 perradial rudiments of tentacles and 4 smaller interradial rudiments (Pl. 11, fig. 7).

The individual (both nutritive and reproductive) polyps of a colony from the Kara Sea are small. Some of the female gonophores are sufficiently advanced to show the rudiments of tentacle bulbs and radial canals. Here the blastostyles are more reduced than in some of the other colonies and often only one or two stumps of tentacles are left (Pl. 11, figs. 5 and 6). The proboscis of the reduced blastostyle is well armed with nematocysts. Eggs are numerous at first but become reduced in number to 10–15 in the ripe gonophore.

As will be noticed from Table I there is a considerable range in the size of the nutritive polyps and the very large size of the polyps in two colonies (one from Mackenzie Bay, St. 27 and the other from north of the New Siberian Islands) made me suspect that a different species was involved, but a careful re-examination of the material revealed no essential points of difference in any of the colonies except in size and degree of maturity of the gonophores.

TABLE I.—*Hydractinia allmani* Bonnevie.

(Measurements in mm.)

	Mackenzie Bay, E. Greenland			Gulf of Middendorff, Kara Sea	North of New Siberian Islands
	St. 17	St. 23	St. 27		
Length of nutritive polyp	2·4–2·7	1·4–3·1	7·0–13·5	2·0–2·2	3·1–12·0
Maximum diameter of polyp	0·4–0·5	0·2–0·4	0·5–0·9	0·2–0·7	0·7–0·9
Length of hypostome	0·5–0·6	0·3–0·4	0·6–0·8	0·3–0·35	0·5–0·8
Height of reproductive polyp	1·5–1·7	1·1–2·9	2·3–4·5	0·75–1·4	1·5–3·3
Length of gonophore	1·1–1·3	0·9–1·1	0·6–1·4	0·6–1·1	1·1–1·4
Diameter of gonophore	1·0–1·2	0·9–1·1	0·3–1·3	0·5–1·1	1·0–1·3

In these colonies the nutritive polyps are more than twice the size of the largest reproductive polyps; the latter have up to 8 tentacles and are very similar to the sterile polyps. It is not possible to be completely certain that they are reduced from the nutritive polyps through bearing gonophores, as in *Podocoryne carnea*, but it may be that we have here the beginnings of the specialization which results in the production of the specialized reduced reproductive polyps seen in *Hydractinia echinata*.

In the remaining colonies there is some overlap in the size of the two kinds of polyps, and in view of the small size of all the polyps it appears likely that they are reduced by prolonged breeding. This raises the question of the status of *Hydractinia ornata* Bonnevie, which, as far as I can see, is distinguished from *H. allmani* only on size; its status must await the re-investigation of the original material.

There is one feature in the reduction of the reproductive polyp which is worth noting. The proboscis of the very reduced polyp is armed with nematocysts, these being concentrated at its tip as the tentacles are resorbed. The use of this character (an armed proboscis) in classification should therefore be used with caution.

Biology. In all records where the substratum of *Hydractinia allmani* has been indicated, the gastropod involved has been *Sipho curtus* (Jeffreys). In the high Arctic the hydroid occurs at depths of 3–760 m. in Greenland, 75–350 m. off Spitzbergen and in 12–40 m. in the more easterly localities.

Records of this species from off the Norwegian coast in comparatively deep water (*see* Distribution) suggest that this submergence is related to temperature. A colony reported by Jäderholm (1909, p. 49) was dredged from 350 m. where the bottom temperature was 2·73° C., while Bonnevie (1899, p. 11) recorded the species from bottoms where the temperatures were — 1° C. and — 1·2° C. Comparable temperatures (given by Ekman, 1953, p. 166) exist at the other localities at which this species has been found.

It is probable that *Hydractinia allmani* can be regarded as a stenothermal cold water species.

Historical and Relationships. Since Bonnevie described the species in 1898, numerous records indicate that this is a common species in the high Arctic. It can be readily distinguished from *Hydractinia monocarpa* and *H. echinata* by its simple smooth spines; from *Podocoryne* it is separated by its fixed gonophores. Compared with *H. carica*, it is more robust in habit, with longer polyps and more polyp-like reproductive zooids. The numerous eggs in the female gonophores (eggs are few in number in the gonophores of *H. carica*) also help to distinguish it.

Hydractinia carica Bergh 1887

Hydractinia carica Bergh, 1887, *Lütken, C.F. Dijmphna-Togtets zool.-bot. Ubbytte*, p. 331, pl. xxviii, fig. 1.
Schydlowsky, 1902, *Trav. Soc. Nat. Univ. Kharkow*, **36** : 114.
Hartlaub, 1905, *Zool. Jb. Suppl.*, **6**, Bd. **3** : 518.
Jäderholm, 1908, *Mém. Acad. Sci. St. Petersb.* (8) **18**, No. 12 : 8.
Jäderholm, 1909, *K. Svenska Vetens.-Akad. Handl.*, **45**, No. 1 : p. 48, pl. ii, figs. 10 and 11.
Broch, 1910, *Fauna Arctica*, **5** : 200.
Broch, 1916, *Danish Ingolf Expedition*, **5**, Part 6 : 48, pl. i, fig. 11.
Scheuring, 1922, *Wiss. Meeresuntersuch. Abt. Helgoland*, **13** : p. 168.
Rylov, 1923, *Annu. Mus. Zool. Acad. St. Peterb.*, **24** : 150, Taf. vi, figs. 2–3.
Fraser, 1931, *Contr. Canad. Biol.*, N.S., **6** : 6.
Uschakow, 1937, *Trans. Arct. Inst. Leningr.* **50** : 12.
Fraser, 1944, *Hydroids Atlant. Coast N. America*, p. 77, pl. xiii, fig. 53.

Hydractinia minuta Bonnevie, 1898, *Z. wiss. Zool.*, **63** : 468, pl. xxvi, fig. 38.
Bonnevie, 1899, *Norske Nordhavs Exped.* 1876–8, **26**, Zool. : 47 pl. i, fig. 3.
Bonnevie, 1901, *Meeresfauna von Bergen. Hydr.*, **1** : 7.
Broch, 1910, *Fauna Arctica*, **5** : p. 141 and 200.

TYPE LOCALITY. Petuchoffskoi Schar, Kara Sea, 15 m. (*Dijmphna Expedition*—Zoological Museum, Copenhagen).

MATERIAL SEEN. In Riksmuseum, Stockholm:

Fragment of type material on a mounted slide.
Bellsund, Spitzbergen, 20 fm. 22nd July, 1864 (A. J. Malmgren)
Bellsund, Spitzbergen, 8–12 fm. (Otto Torrell)
Recherche Bay, Spitzbergen, 13th July, 1898 (Spitzbergen Expedition, 1898)
67° 56′ N., 66° 18′ W., 13th October, 1897 (E. Nilsson)
Russian Polar Expedition, 1900–1903, St. 3, Murman Sea, 69° 35′ N., 50° 5′ E.; 70 m.

In British Museum:

Klaas Billen Bay, Spitzbergen, 28th July, 1921, C. S. Elton (Oxford Univ. Exped. to Spitzbergen, 1921).

SPECIFIC CHARACTERS. *Hydractinia* with encrusting base with few high conical smooth spines (up to 0·7 mm. high) with rounded apices. Nutritive polyps, small, up to 2·3 mm. high when fixed, with a single whorl of 10–16 tentacles. Proboscis simple, almost unarmed. No spiral zooids known.

Reproductive polyps up to 2·3 mm. high, at first with conical hypostome and at least 8 tentacles, becoming greatly reduced to very short stumps without tentacles; proboscis armed with nematocysts when present. Gonophores 3–7 in number borne in a ring round the polyp.

Gonophores cryptomedusoid, with 4 radial canals and rudiments of tentacles present but not developed into bulbs. Eggs large, 4–10 in number.

DISTRIBUTION. *Hydractinia carica* is known from the Kara Sea (Bergh, 1887), the Barents Sea (Jäderholm, 1908; Scheuring, 1922), Spitzbergen, the Davis Strait area (West Greenland) and on the Norwegian coast in the neighbourhood of Bergen.

There are numerous records of this species from Spitzbergen, most of these being summarized by Jäderholm (1909) and Rylov (1923). I have been able to verify Jäderholm's record (1908) from Davis Strait and there are others by Fraser (1931 and 1944 as *carica* and *minuta*) from approximately the same area. The most southerly record is that of Bonnevie (1901) from the Hjeltefjord, Bergen as *H. minuta*.

There is insufficient information to hazard any opinion as to whether this species has a circumpolar distribution.

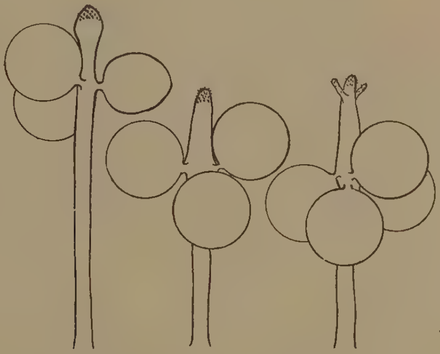
DESCRIPTION. This is an encrusting species with large spines but without small prickles. The large spines are simple, smooth and not sharply pointed; they have no pore at the tip and in size range up to 0·7 mm. in length.

In preserved material the hydranths are tubular to fusiform in shape and may be over 2·0 mm. in height. The head of the hydranth is sometimes clavate and there is a conical proboscis without many nematocysts around the mouth. There are usually about 16 tentacles arranged more or less in a single whorl.

The reproductive polyps vary considerably from colony to colony according to the stage they had reached when taken, and it has been deemed desirable to describe them in the different colonies.

In the colony from Bellsund, Spitzbergen the reproductive polyps are completely reduced to very short stumps 0·17 mm. or less in length, bearing up to 5 gonophores each. These have diameters of about 0·45 mm. Sterile hydranths are 1·3–2·0 mm. in length.

Another colony from Recherche Bay, Spitzbergen, does not appear to have reached the same state of reproductive exhaustion as the one from Bellsund. In this colony the fertile polyps are still recognizable as polyps ; one of these still possessed 8 fully developed tentacles and a distinct proboscis and carried 5 moderately developed gonophores. Another reproductive polyp, with a height of 0·9 mm., had 7–8 tentacles and 4 gonophores each with a diameter of 0·3 mm.



Text-fig. 1.—*Hydractinia carica* Bergh : blastostyles from a colony from Recherche Bay, Spitzbergen (Swedish Spitzbergen Expedition, 1898).

A colony from position 67° 56′ N., 66° 18′ W., had particularly large blastostyles, 1·0–2·3 mm. in height to hypostome. These had 3–5 gonophores each and only a few had up to 2 reduced tentacles. The hypostome was usually well armed with nematocysts.

There were only a few very reduced polyps. These were so short that they could not be measured accurately ; they carried 5–7 gonophores and were clearly reaching the exhaustion stage.

Colonies from the Murmansk coast and Bellsund, Spitzbergen, were fertile and some of the reproductive polyps of these possessed 2 or more tentacles.

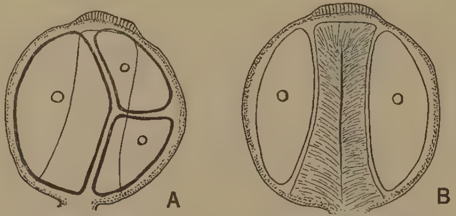
A mounted slide marked *Orig. Ex.*, Dijmphna Exp. presented by Levinsen appears to consist of part of the type material of this species. Measurements of this and other colonies in the Riksmuseum are given in Table II. Some of the reproductive polyps carry about 4 tentacles and others have lost them (Text-fig. 1).

TABLE II.—*Hydractinia carica* Bergh

(Measurements in mm.)

	Kara Sea (fragment of type material)	67° 56′ N., 66° 18′ W.	Bell Sound, Spitzbergen
Length of polyp	1·5–1·7	1·0–2·3	1·0–2·0
Maximum diameter of polyp	0·3–0·4	0·1–0·2	0·2–0·3
Length of hypostome	0·4	0·2	0·1–0·3
Height of reproductive polyp	0·75–0·9	0·1–2·3	0·17–0·2
Length of gonophore	0·28–0·4	0·3–0·4	0·45
Diameter of gonophore	0·25–0·4	0·3–0·4	0·45
Length of spine	—	—	0·37–0·7

Only female gonophores have been noted in this material ; they are cryptomedusoids without radial canals but with apical patches of nematocysts. There is a well-developed manubrium and when ripe the gonophores contain 4–10 large eggs each (Text-fig. 2, *a*, *b*).



Text-fig. 2.—*Hydractinia carica* Bergh ; gonophores from a fragment of the type colony, Kara Sea (Dijmphna Expedition) : *a*, female gonophore ; *b*, another female gonophore in optical section.

This material agrees with the earlier descriptions of Bergh (1887), Jäderholm (1908) and Broch (1916), but it has been possible to get a better picture of the species as a whole. The nutritive polyps (in preserved material) are seldom more than 2·0 mm. in height and it is possible that the reproductive polyps are derived directly from them. Bergh and the other authors indicated that the reproductive polyps might have 1–4 tentacles, but I have found 8 which supports my suggestion. Jäderholm (1909, pl. ii, figs. 10 and 11) gives good illustrations of partially reduced hydranths, and others are figured here (Fig. 1), but they may become so short that even the hypostome is almost completely reduced and the stalk below the point of origin of the gonophores also becomes extremely short. Broch (1916, p. 48) is undoubtedly right in his contention that Bonnevie's *H. minuta* (Bonnevie, 1899, p. 48) is identical with *H. carica*. I regard the colony she described as being in an advanced stage of reproductive exhaustion.

BIOLOGY. This species favours the shells of various northern species of *Buccinum* as a substratum. In the Barents Sea it has been found on *Buccinum undatum* and *B. tenue*. In the Spitzbergen area Jäderholm (1909) has found it on *Buccinum glaciale* and *Trophon clathrus*, while Rylov (1923) reported it as *H. minuta* on *Buccinum ovum* and *B. ciliatum*.

The bathymetric range appears to be 0–120 m. in the Spitzbergen area and 40–70 m. in the Barents Sea.

Hydractinia carica may be regarded as mainly a cold water species which, if Bonnevie's record from Bergen is authentic, is probably less stenothermal than *H. allmani*.

HISTORICAL AND RELATIONSHIPS. *Hydractinia carica* was described by Bergh (1887) from Petuchoffskoi Schar in the Kara Sea from a depth of 15 metres. Subsequently it was recorded many times in the far north and as *H. minuta* Bonnevie from Spitzbergen and elsewhere. As a species it is distinguished from other northern *Hydractinia* by its simple smooth spines, the extreme reduction which takes place in its reproductive polyps and by its gonophores. These have no radial canals and the female ones have few eggs.

Hydractinia monocarpa Allman

Hydractinia monocarpa Allman, 1874, *Nature, Lond.* **11**, No. 270 : 179.
Marktanner, 1895, *Zool. Jb.* (*Syst.*), **8** : 394.
Schydlowsky, 1902, *Trav. Soc. nat. Univ. Kharkow*, **36** : 114.
Hartlaub, 1905, *Zool. Jb. Suppl.* **6**, Bd. 3 : 518.
Jäderholm, 1908, *Mém. Acad. Sci. St. Petersb.* (8), *Cl. Phys.-Math.* **18**, No. 12 : 8, Taf. 1, fig. 6, Taf. 2, figs. 6–9.
Jäderholm, 1909, *K. Svenska Vetens.-Akad. Handl.* **45**, No. 1 : 49, Taf. ii, figs. 12–13.
Broch, 1910, *Fauna Arctica*, **5** : 141.
Broch, 1916, *Danish Ingolf Exped.* **5**, Pt. 6 : 47.
Rylov, 1923, *Annu. Mus. Zool. Acad. St. Petersb.* **24** : 148, Taf. VI, fig. 7.
Kramp, 1932, *Medd. Grønland*, **79**, No. 1 : 16.
Uschakow, 1937, *Trans. Arct. Inst. Leningr.*, **50** : 12.
Fraser, 1944, *Hydroids Atlantic Coast N. America*, p. 77.

Hydractinia echinata, Winther, 1880, *Naturh. Tidsskr.* **12** : 227, 254.
Levinsen, 1893, *Vidensk. Medd. naturh. Foren København*, 1892, p. 153.

TYPE LOCALITY. Spitzbergen, on *Trophon clathratus* L. (Allman, 1876) (Zoological Museum, Copenhagen)

MATERIAL SEEN. In Riksmuseum, Stockholm :

Matotschkim Schar, 15 fm. (Novaya Zemlya Expedition, 1875).
Russian Polar Expedition, 1900–1903, St. 53, 77° 10′ N., 142° 48′ E. (N. of New Siberian Isles) 35 m., on *Trophon clathratus* and *Bela plicifera*.

SPECIFIC CHARACTERS. *Hydractinia* with encrusting base with long, often irregular, hollow spines which may bifurcate distally. Spines longitudinally keeled especially at base, but smooth and not thorned, up to 2·4 mm. high. Nutritive polyps fusiform to tubular, up to 3·6 mm. high, borne on the encrusting base or on the sides of the spines. Tentacles, 10–15. Spiral zooids not known.

Reproductive polyps, up to 1·5 mm. high, with armed proboscis and at least 4 tentacles, or may be reduced without tentacles and greatly shortened. Gonophores 1–4 on each, but usually only one.

Gonophores : female, up to 1·4 mm. in diameter ; cryptomedusoid with 4 radial canals and apical patch of tissue. Male gonophores similar, up to 0·55–0·6 mm. in diameter.

DISTRIBUTION. All records of this species are from the high Arctic, chiefly from Spitzbergen, Novaya Zemlya and the New Siberian Isles. It appears to be a common species on shells at Spitzbergen (Allman, 1876 ; Jäderholm, 1909 and 1916 ; and Broch, 1910). The Russian Polar Expedition 1900–1903 took it at two stations off the New Siberian Islands and in Chatanga Bay in Nordenskjold's Sea (Jäderholm, 1908). Records from Novaya Zemlya are given by Jäderholm (1909).

West Greenland records from Upernivik and from near Cape Atholl are given by Kramp (1932). This distribution suggests that the species is circumpolar.

DESCRIPTION. This species has an encrusting base, but the most characteristic feature is the presence of long, upright irregularly-formed spines rising to a height of about 3 mm. (Pl. 12, figs. 8–11). The spines are seldom straight or symmetrical and are usually curved towards the tip which tapers to an open hyaline or horn-coloured tube. Frequently the spines are double or bifurcated and their surface is seldom smooth. The naked coenosarc may cover a good part of the spines.

The nutritive hydranths may be long and tubular reaching (when expanded) a considerable length. Some preserved examples, moderately well fixed, have a length of 3·6 mm., but, when contracted, may only be one-third or less than this length. Such retracted polyps are either cylindrical or flask-shaped (Pl. 12, figs. 9 and 10). The hypostome carries nematocysts, particularly near the tip, but they are few in number. There are 10–14 tentacles. A curious feature of this species is that one or more polyps may be carried on the spines themselves and I have seen up to three on one spine (Pl. 12, figs. 9 and 10).

The reproductive polyps, noted in the material seen, were up to 1·5 mm. in height and were provided with up to 4 tentacles. Each had an armed tip to the proboscis and carried up to 4 gonophores. Only female gonophores have been noted by me ; these are large, 0·5–0·7 mm. in diameter and are cryptomedusoids with manubrium and radial canals. It is clear that the blastostyles become considerably reduced due to reproductive exhaustion. Frequently they are reduced so much that the gonophores appears to be almost sessile on the coenosarc. When this happens the upper part of the polyp seems to become larger and more polypoid, but the stalk below the point of origin of the gonophore is extremely short.

In his original description Allman (1874) described the reproductive polyps as devoid of tentacles, but tentacles have been noted by Jäderholm (1908). Rylov (1923), Kramp (1932) and by myself. The diagnosis of the species (p. 25) differs greatly from that of Allman because more colonies have been available for study.

BIOLOGY. *Hydractinia monocarpa* has been found on the shells of gastropods such as *Trophon clathrus*, *Bela plicifera* and *Buccinum hydrophanum* (Jäderholm, 1908, 1916, and Kramp, 1932). The hydroid may grow all over the shell as in a specimen of *Bela plicifera* from Kol Bay, Isfjord, Spitzbergen. The nutritive and reproductive polyps flourish best in and near the sutures between whorls, but they also occur on exposed surfaces and are absent only on abraded surfaces of the shell. The tall spines are fairly closely grouped and must offer some protection to the zooids.

The species has a known bathymetric range of 14–165 metres, the deepest record being from West Greenland (Kramp, 1932). Most of the records from Spitzbergen and elsewhere in the Polar Sea are, however, from shallow coastal waters.

Hydractinia monocarpa may be regarded as a high Arctic or stenothermal cold water species.

HISTORICAL AND RELATIONSHIPS. *Hydractinia monocarpa* was described by Allman from a colony labelled " Spitzbergen " in the Zoologiske Museum, Copenhagen. It has since been found frequently in the Spitzbergen area and elsewhere in the high Arctic.

This distinctive species, with its long, hollow, often bifurcated spines, its polyps arising from both encrusting base and spines, its cryptomedusoid gonophores, with four radial canals but without tentacle rudiments, cannot be mistaken for any other northern species.

The presence of hydranths on the spines recalls the much greater development of this feature in *Hydrissa sodalis* (Stimpson) from East Asiatic seas.

ACKNOWLEDGEMENTS

I wish to thank Dr. Bengt Hubendick for hospitality while examining this material at the Riksmuseum, Stockholm, and also for the loan of some of it for more detailed examination in London. I also wish to thank Mr. M. G. Sawyers for the care he has taken in preparing the photographs of *Hydractinia allmani* and *H. monocarpa* from slides made by the late Elof Jäderholm.

DISCUSSION

Colonies of *Hydractinia allmani* show marked variation according to the stage of reproductive exhaustion reached at time of capture and it has been suggested here that the reproductive polyps in this species are derived from nutritive ones. The great variation in the size of nutritive polyps and in the reproductive polyps (from well formed ones to almost blastostyles) is highly significant, and implies that we must use these features with great caution in distinguishing species. It brings to mind the very large number of boreal and tropical species of *Hydractinia* which have been described on single colonies. A critical study of these must result in a great reduction in the number of recognizable species. Another feature, noted in this paper, is the concentration of nematocysts in the tip of the hypostome as the tentacles are resorbed during reduction of the polyp. It means that the armed proboscis, too, must be used with discretion as a diagnostic character.

The study of *Hydractinia carica* also bears out the general conclusions noted above, but this species is notable for the almost complete resorption of the reproductive polyp and shortening of its stem, so that the gonophores sometimes give the appearance of being sessile on the hydrorhiza and even the hypostome may disappear. This, too, is a factor to be considered in classification.

Although *H. monocarpa* can be readily distinguished by its spines, its reproductive polyps vary according to phase and bear out the general conclusions reached for the other two species.

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PLATE II

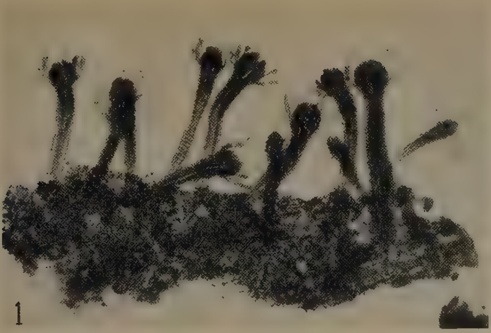
Hydractinia allmani Bonnevie

Figs. 1 and 2.—Fragments of a colony from St. 23, Mackenzie Bay, East Greenland (Swedish Zoological Polar Expedition, 1900); × 10.

Figs. 3 and 4.—Fragments of a colony from St. 27, Muskoxfjord, Franz Josef Fjord (Swedish Zoological Polar Expedition, 1900); × 5.

Figs. 5 and 6.—Reproductive zooids with female gonophores; St. 18, Karahavet, Middendorff's Sea (Russian Polar Expedition, 1900–1903); × 25.

Fig. 7.—Reproductive zooid with ripe female gonophore; St. 50, north of New Siberian Islands (Russian Polar Expedition, 1900–1903); × 14.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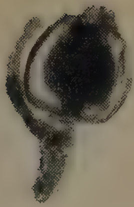
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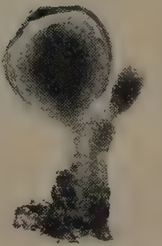
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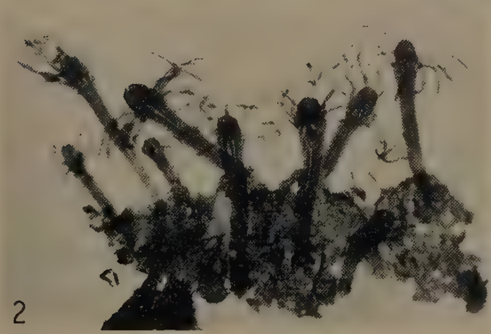
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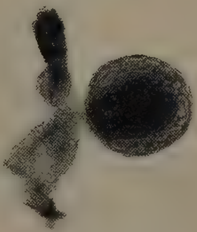
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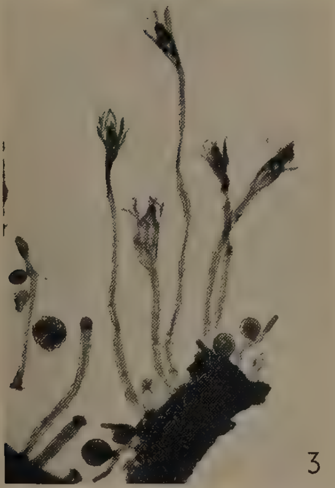
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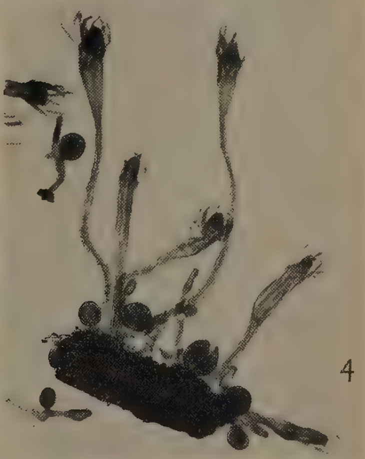

4

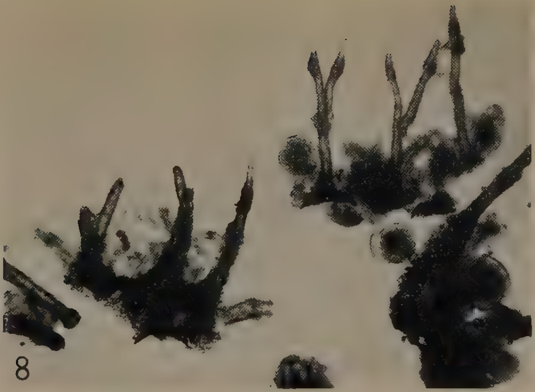
Hydractinia allmani Bonnevie.

PLATE 12

Hydractinia monocarpa Allman from St. 53, north of New Siberian Islands (Russian Polar Expedition, 1900–1903).

Fig. 8.—Spines and female gonophores; × 12.

Figs. 9–11.—Spines and nutritive polyps; × 20, × 21, × 25.



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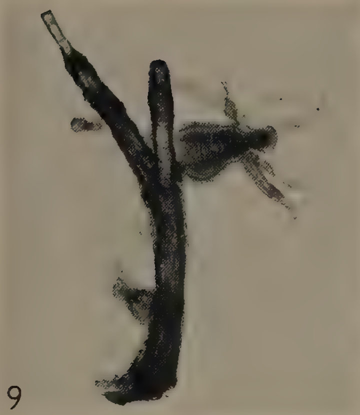

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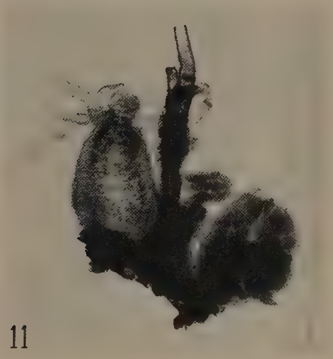

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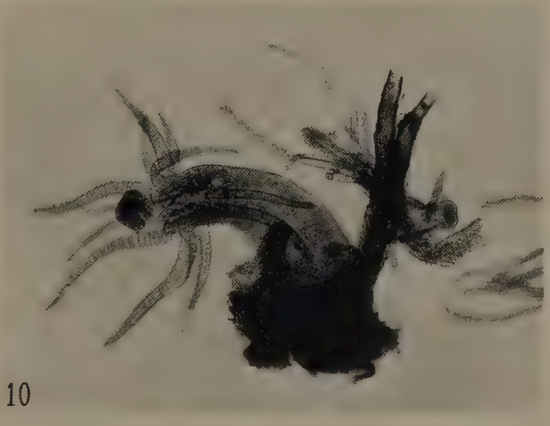

10

Hydractinia monocarpa Allman.

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